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A new field strength model was developed for PROPHET which was a significant departure from prior versions. Until recently, the model was based on that developed by the Deutsche Bundespost (Damboldt, T., NATO AGARD Conference Proc. — No. 173, 1975). In the new model, the Deutsche Bundespost model was replaced for paths shorter than 7000 km by a model relying on propagation via the regular E-layer and the F2-layer. The routine finds a lower order mode for the E-layer, F2-layer, and a mixed E-layer and F2-layer. Only one E-layer hop is considered in the mixed mode. The MUF model used is the NIMIMUF-85 model (Sailors et al., NOSC TR 1121, July 1986). The E-layer MUF is calculated as in IONOCAP.

The ionospheric absorption equation is the one used in IONOCAP with the near specular reflection losses calculated for E-layer modes at low frequencies. The over-the-MUF losses are calculated using the Phillips (Wheeler, J.L., Radio Sci., 1, 1303-1308, 1966) method for values of frequency/MUF ratio up to about 1.5 MHz depending on ground distance and with values greater being considerd in the "scatter" region. The losses above these values are estimated as in IONOCAP. The value of the absorption index I at night has a value which is a function of solar activity (Wakii, J. Radio Res. Labs, Japan, 18, 191-208, May 1971). All the losses calculated are a function of geomagnetic latitude, length of path, time of day and season since the excess system loss tables of IONOCAP are used in the module along with the distribution of the MUFs.

Using CCIR Data Base C, the new model's bias and rms error for frequencies less than the MUF are 1.1dB high and 13.5dB, respectively, and for frequencies above the MUF the bias and rms error were 2.7dB low and 15.8dB, respectively. The most pronounced improvement seems to be in the over-the-MUF loss which shows a much lower average residual from the previous method of about one-fifth and an rms residual of less than one-half.

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DEVELOPMENT OF A NEW FIELD STRENGTH MODEL FOR PROPHET

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